

On Nov 6, 2013, at 2:24 PM, John German <john@theicct.org> wrote:

Byron/Linc,

Following is a summary put together by Francisco of the PEMS data gathered by WVU on three US diesel cars. The vehicles were driven repeatedly over the same test route and the results averaged in the attached. In our public reports we will not identify the specific vehicles, so please do not release this information, but vehicle 1 is the Jetta (LNT), vehicle 2 is the Passat (SCR), and vehicle 3 is the X5 (SCR).

<WVU US PEMS data summary.docx>

Note the extremely high NOx emissions on the Jetta and the Passat - over all types of driving. The X5 was much better and only showed high emissions over the rural uphill/downhill route.

CARB did do dyno testing on these vehicles. Attached is a spreadsheet put together by Francisco which summarizes the dyno results on the Jetta (LNT) and the Passat (SCR). CARB also tested the X5, but its emissions were fine in our PEMS testing so we haven't summarized the dyno results yet.

<ARB Summary Emission results V1 V2 - v2.xlsx>

As you can see from the data, we have two emission concerns even on the dyno testing:

1) NOx emissions on the US06 cycle varied wildly from test to test on both the Jetta and the Passat.

- Jetta: 1.19 gNOx/mi on the first test, 0.104 on the second
- Passat: 0.24 gNOx/mi on the first test (improperly run with the Jetta road load), 1.17 on the 2nd test (although the DPF regenerated on this test) and 0.001 on the third test.

2) The DPF regenerated on three of the tests: one of the Jetta US06 tests, one of the Passat US06 tests, and one of the Passat NEDC tests. The impacts of the DPF regeneration were as follows:

- Jetta US06: CO2 increased from 300 g/mi to 400; NOx was 1.08 g/mi, compared to 1.19 and 0.104 for the two tests without regeneration.
- Passat US06: CO2 increased from 284 to 359; NOx increased from 0.001 to 1.17
- Passat NEDC bag 2: CO2 increased from 214 to 350 g/mi; NOx increased from 0.04 to 0.31
- Passat NEDC bag 4: CO2 increased from 267 to 363 g/mi; NOx increased from 0.06 to 0.24.

More information on this can be found in the email exchange between Francisco, Vicente, and myself, below.

Francisco plans on digging into the second by second data, to try to figure out why the impacts of DPF regeneration are so large and why the NOx emissions on the US06 cycles vary so widely. Also, why the emissions were so high on the PEMS testing. Of course, these are very large files so it will likely take some time for us to go through them.

If you wish, we would be willing to share the WVU PEMS data with you once we have finished auditing the raw data and our QA/QC. We aren't completely sure that all the data is good and that our data scripts are working properly, so we need to get this straightened out before we send you the second by second data. We also want to identify cold starts in the PEMS data and analyze these separately, which hasn't been done yet.

But the dyno test results also indicate some NOx issues, which gives us some confidence that the VW vehicles have some emission control issues.

John

On Nov 6, 2013, at 11:07 AM, Francisco Posada <francisco@theicct.org> wrote:

Yes, for the Passat, the ones marked with 0, as invalid tests, were tested under a different dyno setting, actually matching the one of the Jetta. Those can be used for comparing the concentrations along the time and checking on regen events, as you suggest.

One interesting thing for the Jetta (Vehicle A) is that LNT requires rich operation periodically; for LNT to reduce the trapped NOx there is a late fuel injection and rich conditions are generated. This might explain the variability between tests. I'll check on typical frequencies of LNT enrichment. The OBD data should show exhaust temperature spikes related to LNT enrichment, and maybe we can track sudden changes in NOx concentrations after those events. This would be different from DPF regen events too.

On the Passat (SCR), the effect of DPF regen on NOx emissions was identified by WVU on HD truck PEMS testing, but they have not made that public yet. It seems to be manufacturer dependent, with some OEMs shutting down the SCR during DPF regen (out of NTE zone!!). For the measured truck, the total cumulative NOx during DPF regen events was 30% of the total cumulative NOx during the trip. We may be witnessing something similar on LDVs. It is all in the modal data, which i have to dig on.

Regarding emissions and FE regulatory mistakes, I wonder what happen to DPF regen for HDV fuel economy calculations. I assume the same.

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On Nov 6, 2013, at 10:42 AM, John German <john@theicct.org> wrote:

Thanks, Francisco.

First, I think you pulled the wrong US06 Passat test for the summary table. It includes the test with 1.165 gNOx/mi and 359gCO2/mi, but this is listed as a test when regeneration occurred in the complete test data. From the test data, it looks like there was only one valid US06 on the Passat?

For the Passat, you have a number of tests that are listed as invalid due to dyno sets. But I think the tests are OK, they were just run with the wrong load?

If so, the US06 test is interesting. It had 0.3 gNOx/mi with the invalid dyno load, compared to 0.0012 for the test with the correct load. CO2 emissions were also a bit higher, at 303 compared to 284. Although, the 0.0012 NOx result with the correct load doesn't seem as if it could possibly be correct. Can you check into this?

So, when you look at the second by second data, in addition to trying to find events in the US06 that triggered high NOx emissions, you should also look at the US06 test with the improper load on the Passat, to see what caused the high NOx.

Also, of course, why the two valid US06 tests on the Jetta had NOx emissions that differed by a factor of 11 (1.19 versus 0.104)

Not sure what you are asking for with "the typical US06/FTP ratio for CO2 along the cycle in g/mile". You have the results from the CARB testing. Also, the Ricardo modeling for the baseline diesel vehicles found the following:
<PastedGraphic-1.pdf>

So, the US06 has roughly 20% higher CO2/mi than the FTP.

Looking at the Passat data, the tests with regeneration events had huge impacts on CO2 - and NOx. The US06 test where regeneration occurred increased gCO2/mi to 359 from 284 for the valid test (and 303 for the test with the invalid dyno load); NOx increased to 1.165 g/mi compared to 0.001 for the valid test and 0.3 for the test with the improper dyno load. US6 CO2 emissions increased from 300 to 400 on the Jetta with the regeneration event and NOx was 1.08 (compared to 1.19 and 0.10 for the valid tests).

The regeneration event on the NEDC with the Passat showed similar effects. Bag 2 gCO2/mi increased from 214 to 350 and NOx from 0.04 to 0.31. Bag 4 gCO2/mi increased from 267 to 363 and NOx from 0.06 to 0.24.

It looks like CARB and EPA are making a huge mistake by excluding regeneration events from calculation of NOx compliance. And EPA is making another mistake excluding regeneration events from the fuel economy calculations.

John

On Nov 5, 2013, at 5:55 PM, Francisco Posada <francisco@theicct.org> wrote:

This time with the attachment
<ARB Summary Emission results V1 V2.xlsx>

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On Nov 5, 2013, at 5:44 PM, Francisco Posada <francisco@theicct.org> wrote:

Hi John, this new version has corrected a few issues and also make it clear for other people to follow. You can check all the test results on the first Sheet.

Please note that some tests, on the test ID column, are marked with a brown cell color. Those indicate Regeneration events. In some cases regen events explain the differences on emissions and CO2. In one case a regeneration event was not detected but still we got huge differences between US06s. I'll look at the modal data for NOx and FTP vs NEDC as you suggest.

John, what is the typical US06/FTP ratio for CO2 along the cycle in g/mile? (I guess should be a ratio higher than NEDC/FTP)

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On Nov 5, 2013, at 3:16 PM, John German <john@theicct.org> wrote:

Thanks, Francisco.

Why are the US06 NOx results so different for the repeat tests on each vehicle? Run 1 on each vehicle had more than 1 g/mi NOx, while run 2 had 0.1 for the Jetta and 0.001 g/mi for the Passat. Also, the test results in the bag data worksheets don't match the test results in the test summary worksheet:

- Jetta: NOx and NOx are not listed for run #1 on the bag data worksheet, but is 1.188 on the test summary
- Passat: NOx is not listed on the bag data worksheet, although NOx is listed there as 1.3527. Test summary has NOx of 1.165.

Also, the Jetta had 8 times higher emissions on the NEDC than it did on the FTP, while the Passat NEDC results were only twice the FTP results.

Really hard to understand these results. Do we have second by second emissions for the dyno tests? If so, we should look at the results to see where the high NOx emissions are coming from and why (a) the US06 results are not repeatable and (b) why the NEDC emissions are so much higher than the FTP.

John

On Nov 5, 2013, at 2:50 PM, Francisco Posada <francisco@theicct.org> wrote:

Hi John,

The excel file named ARB Summary Emission results V1 V2.xlsx has the ARB chassis test results. It is separated as vehicle a (LNT) and Vehicle B (SCR)

FP

Sent from Samsung Mobile

----- Original message -----

From: John German <john@theicct.org>

Date:

To: Francisco Posada <francisco@theicct.org>

Cc: Peter Mock <peter@theicct.org>, Anup Bandivadekar <anup@theicct.org>, Vicente Franco <vicente@theicct.org>

Subject: Re:US PEMS data discussion

Your spreadsheet didn't include any test results, Francisco.

Your plan for sharing reports sounds good to me.

I agree we need to be cautious here. But a good first step will be to compare the dyno test results to the PEMS results. I'd like to see this as soon as we can.

Can we get the same vehicles tested by WVU to EPA? If so, Bryan indicated they would be happy to another round of dyno testing on them. And we could ask them to use their PEMS equipment for some additional PEMS testing - although it isn't a good time of year to do outdoor emission testing in Michigan.

John

On Nov 5, 2013, at 12:26 PM, Francisco Posada

<francisco@theicct.org> wrote:

Hi John,

1. On ARB data, we have FTP, NEDC and US06 data for a VW Passat TDI (SCR), a VW Jetta TDI (LNT). I'll ask ARB for permission to share the raw data if required. More detailed test data on the attached files. The file 2R1303 Testing from ARB shows regeneration events.

2. I agree with Vicente, our PEMS data should be shared. Attached you will find a 3 pages summary of PEMS results from WVU.

3. We can talk about several reports, one from WVU on PEMS testing and one from ICCT, which covers all the nice comparisons with EU vehicles that Vicente is doing with. The WVU report is overdue, and I'm pressuring WVU with releasing it quickly. I'd suggest we use that as an official PEMS report for EPA. This plus the ARB testing would cover the official testing results for US vehicles. I'd prefer to share the SAE draft a bit later after I get a complete analysis from WVU and other sources.

Bottom line is that I'm being a bit cautious here as it bothers me greatly that the emission values were so high. WVU already detected one error on flowrate calculation after I started pushing them to go through the calculations and share them other data to compare with. They were checking temperature profiles too.

I actually would like to propose we delay the release of official ICCT materials until a second round of testing is conducted for both vehicle models, the Passat and the Jetta. If EPA could carry, with the help of Carl Fulper, a second round of PEMS testing (not just chassis testing), that would be very helpful. We could share our current preliminary data, and results, but I'd prefer not having our name and logo until a second round of tests confirm that those two VWs systems are performing as poorly as WVU measured. Please do let me know your views on this issue.

<WVU Integrated Emissions Results - Draft.docx>

<2R1303 Tests Summary.xlsx>

<ARB Summary Emission results V1 V2.xlsx>

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On Nov 5, 2013, at 11:57 AM, Vicente Franco

<vicente@theicct.org> wrote:

Hi John,

- 1) We do have chassis dyno data. Perhaps the nicest summary of these is in the SAE draft paper, which Francisco can surely forward to you.
- 2) Sharing the US data is entirely up to us. For the European vehicles we would possibly want a written agreement from JRC and AECC.
- 3) IMHO we should aim for a fairly quick release with the current test vehicle lineup and eventually release periodic PEMS reports as more data come in. For that though it is important that we spend a bit more time working on a standard analysis/reporting method so that we are entirely happy with and we can stick to it for future datasets. I feel we are almost there, and that we could aim for a final draft before the end of the year, hopefully a January 14 release if the internal review process does not take too long. Perhaps the final draft could also be circulated to EPA if they are really anxious to see some results?

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On 5 Nov 2013, at 17:28, John German

<john@theicct.org> wrote:

I had a quick call with Bryon Bunker at EPA about the high emissions on the Passat and the even higher emissions on the Jetta. He was very interested and said that he will talk to Linc Wehrly and see if they have any in-use compliance data on these vehicles.

His immediate requests for ICCT:

- 1) Do we have chassis dyno testing on these vehicles? (I know we were trying to coordinate testing with CARB, but I don't remember if this ever happened.) If not, can we arrange for these vehicles to be tested by EPA at their lab?
- 2) Can we share our data with EPA?
- 3) When do we anticipate

that ICCT will make the data
public?

John

On Nov 5, 2013, at 9:14
AM, Peter Mock
<peter@theicct.org> wrote:

All,

Please find
below the call-in
details for our
call in about 45
minutes.

I hope you can
join. Anup, sorry
for the bad
timing - for some
reason we
thought the US
had not yet
ended daylight
savings time, but
in fact you
already have.



Peter

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1. Please join
my meeting, Nov
5, 2013 at 4:00
PM
GMT+01:00.
[https://www4.go-
to-meeting.com/joi
n/451755199](https://www4.go-to-meeting.com/join/451755199)

2. Join the
conference call:
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726167381
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